GPM Ground Validation UND Citation Cloud Microphysics GCPEx

Introduction

The GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset includes measurements of cloud microphysics, state of the atmosphere parameters, bulk aerosols, three-dimensional winds, and turbulence. These measurements were taken by the University of North Dakota's (UND) Cessna Citation aircraft, an in situ platform for the GCPEx campaign. From January 19, 2012 to February 24, 2012, the Citation flew 12 data missions for a total of 38.4 flight hours. The GPM Ground Validation UND Citation Cloud Microphysics GCPEx data are stored as a separate file for each flight, with a primary (*.gcpex) file containing both direct and derived parameters. Raw data files for each cloud instrument are also archived for investigators who wish to use their own processing software.

Campaign

The GPM Cold-season Precipitation Experiment (GCPEx) occurred in Ontario, Canada during the winter season of 2011-2012. GCPEx addressed shortcomings in the GPM snowfall retrieval algorithm by collecting microphysical properties, associated remote sensing observations, and coordinated model simulations of precipitating snow. These data sets were collected to aid in the achievement of the over arching goal of GCPEx which is to characterize the ability of multi-frequency active and passive microwave sensors to detect and estimate falling snow.

Further details on GCPEx are available at https://ghrc.nsstc.nasa.gov/home/field-campaigns/gcpex. Information on the Global Precipitation Measurement (GPM) mission is available at http://pmm.nasa.gov/GPM.

Platform Description

The UND Cessna Citation II Research Aircraft used for the GCPEx experiment is owned and operated by the University of North Dakota. The Citation II is a twin-engine fanjet with an operating ceiling of 43,000 feet (13.1 km). The turbofan engines provide sufficient power to cruise at speeds of up to 340 knots (175 m s-1) or climb at 3300 feet per minute (16.8 m s- 1). These high performance capabilities are accompanied by relatively low fuel consumption at all altitudes, giving the Citation an on-station time of 3-5 hours, depending on mission type. Long wings allow it to be operated out of relatively short airstrips and to be flown at the slower speeds (140 kts/72 m s-1) necessary for many types of measurements. The Citation is certified for flight into known icing conditions. Further details on the UND Cessna Citation II are available at http://cumulus.atmos.und.edu/.

The GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset contains the following instruments and measurements:

Parameter Measured	Instrument	Instrument Description
State Parameters	Total Temperature Probe	Flight Level Temperature
	Pressure Transducer	Flight Level Pressure
	Cooled Mirror Hydrometer	Dew/Frost Point
	Laser Hygrometer	Dew/Frost Point Temperature
Winds and Turbulence	Gust Probe	Airspeed, Angles of Attack & Sideslip
	Pitot Tube	Airspeed, Turbulence
Cloud Imaging and Sizing	CDP	Cloud Droplet Concentration & Size
	PMS 2DC	Cloud Particle Imaging Probe
	Cloud Imaging Probe (CIP)	Cloud Particle Imaging Probe
	CPI	Small Cloud Particle Imaging Probe
	HVPS-3	Precipitation Particle Imaging Probe
Water	King Probe	Liquid Water Content

	Nevzorov Probe	Liquid Water & Total Water Content
	Rosemount Icing Detector	Supercooled Liquid Water Presence & Content
Aerosols	CPC	Condensation Particle Counter
Aircraft	Applanix	Inertial Platform with Integrated GPS

The complete list of measurements and associated instruments is available in the header block of the QC processed data files. More information on Citation flight days can be found in the GCPEx Citation Mission Summary document. Additional campaign collections containing UND Citation Cloud Microphysics data can be found at http://ghrc.nsstc.nasa.gov.

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File Naming Convention

QC processed files and browse files are of the form:

yyyy_mm_dd_hh_mi_ss.conc.cdp.1Hz
yyyy_mm_dd_hh_mi_ss.gcpex

where,

conc = concentration
cdp = Cloud Droplet Probe
Hz = Hertz
gcpex = GPM Cold-season Precipitation Experiment
yyyy = year
mm = month
dd = day
hh = hour
mi = minute
ss = seconds

Raw files are of the form:

yyyymmdd_hhmiss_mmddhhmi.roi
yyyy_mm_dd_hh_mi_ss.sea
NAVyyyymmddhhmiss.HVPS
baseyyyymmddhhmiss.HVPS

where,

roi = report object instance
sea = Science Engineering Associates
HVPS = High Volume Precipitation Spectrometer

NAV = navigation
yyyy = year
mm = month
dd = day
hh = hour
mm = minute
ss = seconds

Data Format

The GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset consists of QC processed (.conc.cdp.1Hz and .gcpex) files. Processed data files are in the UND-NASA-AMES format. The dataset also contains the raw (.roi, .sea, and .HVPS) files. The Science Engineering and Associates (SEA) model M300 data system manual contains file format information for the .sea files. In order to process the raw .sea data files, the M300 instrument tag numbers need to be used. The SPEC Inc. CPI manual contains file format information for the .roi files. File format information for the .HVPS files is available in the SPEC Inc. HVPS3 manual. The CPI and HVSP manuals can be downloaded at http://www.specinc.com/downloads.

More information on the GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset can be found in the UND Citation Data Summary document. More information on missing data can be found in the GCPEx Citation Data Edit Overview document.

Citation

Our data sets are provided through the NASA Earth Science Data and Information System (ESDIS) Project and the Global Hydrology Resource Center (GHRC) Distributed Active Archive Center (DAAC). GHRC DAAC is one of NASA's Earth Observing System Data and Information System (EOSDIS) data centers that are part of the ESDIS project. ESDIS data are not copyrighted; however, in the event that you publish our data or results derived by using our data, we request that you include an acknowledgment within the text of the article and a citation on your reference list. Examples for general acknowledgments, data set citation in a reference listing, and crediting online web images and information can be found at: https://ghrc.nsstc.nasa.gov/home/about-ghrc/citing-ghrc-daac-data

References

Delene, D. J., Airborne Data Processing and Analysis Software Package, Earth Science Informatics, 4(1), 29-44, 2011, URL:http://dx.doi.org/10.1007/s12145-010-0061-4, DOI: 10.1007/s12145-010-0061-4.

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